

## ABSTRACT

A process is provided for searching in parallel for a plurality of prime number values simultaneously includes the steps of: randomly generating a plurality of  $k$  random odd numbers (wherein  $k$  is preferably more than 2, but could also be one or more)

- 5 expressed as  $n_{0,0}, n_{1,0}, \dots, n_{(k-1),0}$ , each number providing a prime number candidate; determining a plurality of  $y$  additional odd numbers based on each one of the randomly generated odd numbers  $n_{0,0}, n_{1,0}, \dots, n_{(k-1),0}$  to provide additional prime number candidates thereby yielding a total number of prime number candidates; sieving the total number of prime number candidates by performing a small divisor test on each of the candidates in
- 10 order to eliminate candidates revealed to be composite numbers by the small divisor test thereby yielding a sieved number  $s$  of candidates; and performing a first probabilistic primality test on each of the sieved number  $s$  of candidates, each of the plurality of  $s$  first primality tests including an associated exponentiation operation executed by an associated one of a plurality of  $s$  of the exponentiation units, the exponentiation
- 15 operations being performed by the plurality of  $s$  exponentiation units substantially simultaneously in order to eliminate candidates revealed to be composite numbers by the primality test thereby yielding a remaining number  $r$  of candidates.